Office. Mr. Harmon was born in Detroit, Mich., in 1860, received his education in the common schools, and at the Michigan Agricultural College, and had taken a two years' course in the law school of the Columbian University at Washington.

He enlisted in the Signal Corps in September, 1879, and with the exception of about a year served continuously in that corps and after 1891 in the Weather Bureau until his death. He was stationed at Louisville, Minneapolis, Columbia, S. C., and at the Central Office. Mr. Harmon was a man of most kindly and genial disposition and a faithful and efficient observer and clerk.—*H. E. Williams.*

OBSCURE POINTS IN METEOROLOGY.

In a recent publication by the director of the Hongkong Observatory on The Law of Storms in the Eastern Seas there occur paragraphs that have caused some misapprehension and may need a word of comment in order to set the matter right in the minds of our readers. The following extracts are reprinted as preliminary to our comments. Speaking of typhoons in the eastern seas, Dr. Doberck, on page 3, says:

When the trough [A] of low pressure stretches from the south of Hainan through the Bashee Channel right out into the Pacific to the south of Japan and the northeast and southwest winds on either side of it are fresh or strong, the conditions have often been mistaken for two typhoons, one in the China Sea and one to the south of Japan, before ever any typhoon was formed.

The heavy rain is, of course, not the cause of the phenomena, for the rain itself is caused by the air rising in the axis of these depressions, also the water vapor condensing gives out heat, and thus, in the first instance, makes the mercury rise in the barometer before a squall; but there can not be any doubt that the quantity of water vapor condensed to form perhaps 10 inches of rain per day, and whose pressure is thus abstracted from the barometric pressure of the air, causes [B] the permanency of the depressions. It is different with the rainfall in the southwest monsoon. That is spread over a large area and does not give rise to a low pressure in one spot surrounded by higher pressures.

On page 7 he says:

When the wind rises in a typhoon it blows in gusts and the mercury heaves in the barometer. When the wind has reached force 11 it blows in fierce squalls of something about ten minutes' duration, while the mercury heaves up and down as much as a tenth of an inch. The mercury often gives a jump upward as the wind begins to veer in a squall. Then it drops down and gives another upward jump as the wind comes back to nearly its old direction. During these squalls an enormous quantity of rain falls in a few minutes. The temperature falls and rises a fraction of a degree or more. The wind does not return to quite the former direction, except just in front of the center. At the time when the center is nearest, a fierce squall is usually felt, and in that squall the direction of the wind changes considerably and the barometer begins to rise. The squalls appear to be caused by an up [C] and down movement of the air. As the air comes rushing down, the raindrops evaporate in the hotter stratum near the earth's surface, and, owing to the increased tension of water vapor, the barometer (after a fall caused by the cold of evaporation) begins to rise. The wind veers [D] toward the direction of the wind above, which latter is known from the motion of the clouds. Then the air starts to rise with a deluge of rain, caused by the condensation of vapor arriving at the cooler stratum above, while the barometer (after a rise caused [E] by the heat of condensation) drops down, owing to the cessation of the pressure of water vapor condensed into the rain fallen, and the wind resumes the direction determined by the central depression, for the latter is so great in a typhoon and gradients so steep near the center that subsidiary depressions have never occurred in the China Sea.

On page 11 Doberck says:

The wind blows from a region where the air pressure is higher toward one where it is lower. It is, however, deflected toward the right in the northern hemisphere. The force of the wind depends upon the difference of pressure between one place and another situated in the direction where the barometric slope or gradient is greatest. The gradient is measured in hundredths of an inch per 15 nautical miles. The force of the wind corresponding to a certain gradient is greater the hotter the air is, and is different in a typhoon from what it is in the trade, owing to the path of the air particles being curved. * * * [F]

The steepest gradient (1 inch in 15 miles) ever met with occurred in a low latitude in the Pacific. That corresponds to a wind velocity of perhaps about 160 miles per hour at sea level. Such velocities are not uncommon at an altitude of 2,000 feet in severe typhoons. [G] Anything above 80 miles per hour is called a typhoon. It is seen that there is as great a difference between the force of one typhoon and another as between a calm and a storm which nearly reaches typhoon force.

When a typhoon is blowing it is of great importance to have a house well shut up. Windows and doors should be firmly locked, bolted and barred. Damage is frequently caused by shutters being out of repair. Once the wind enters a broken window, it begins to blow through and its force is then quickly felt. As long as all apertures are thoroughly shut on both sides a fearful howling and whistling is heard, the rain blows in through the smallest openings and the house may shake but damage is seldom done. Should a fierce squall get the chance to blow into a house, the roof is often the first part to give way. It is believed that pressure falls so quickly outside that the air confined in the house [H] bursts through the roof like an explosion, but there is no foundation for that belief; it is more likely that a fierce squall would break through the windows and doors, and through the roof as well. But if any fear is entertained of the air being confined inside, it is merely necessary to leave the chimneys open so that pressure inside [I] will be nearly the same as on the outside.

In many typhoons the barometer, reduced to the temperature of freezing water and to sea level, does not fall below 28.80 inches. In others it falls as low as 28.50. Lower readings are rare, but sometimes it falls much lower.

No typhoon ever stands still. As soon as it is formed, it is carried forward by the prevailing wind. That is why [K] the isobars are elongated, except near the center where the force of the prevailing wind is of no account. The isobars could be circular only in a stationary typhoon. That is also why [L] typhoons move so as to keep the areas of high barometer on their right, and so as to recede from areas where the barometer is high, and so as to approach low-pressure areas. Most of the typhoons that originate in the Pacific to the east of the Philippines or Formosa move westward at first, then northwest, then north, then they recurve to the northeast, and beyond Japan they move eastward. This is under the influence of the high-pressure area in the northern Pacific, around which they [M] rotate in the same direction as the hands of a watch. When there are two typhoons about at the same time, they rotate round each other in the opposite direction, that is, abstracting from the influence of the high-pressure areas, which may cause them to move somewhat differently from this simple rule. In the China Sea there is sometimes a low-pressure channel between high pressures in China and in the southern part of the China Sea. A typhoon in the Pacific at such times is attracted toward the China Sea and passes along the low-pressure channel, because the winds blowing to either side of this channel agree with the winds round the center of a typhoon, and they move according to the principle of least action.

The preceding paragraphs suggest the following notes, each of which is lettered to correspond with the capitals inserted in the text:

[A] These troughs of low pressure are common over the northern temperate zone and, doubtless, occur also in the Southern Hemisphere. They have apparently much analogy to the great equatorial trough that extends almost continuously around the globe between the northeast and southeast trade winds of the two hemispheres. Another fine example is the long, narrow trough that frequently extends northward over the peninsula of California into Arizona. Such troughs are frequent over the United States and the adjacent Atlantic Ocean. If an axis extends east and west so that the areas of high pressure are north and south of it, then the barometric depression is slight but the contrasts of temperature are very great. If the axis of the trough trends northeast and southwest, then the depression is greater but the contrasts of temperature are less. In both cases a belt of cloud overlays the trough but the rainfall is light for the east-west troughs and only moderate for the northeast-southwest troughs. In the east-west trough, the principal portion of the area of cloud is on the southern side of the trough, but in the northeast-southwest troughs the principal cloudiness is on the west of the trough. The motions of the clouds indicate that in the east-west trough the surface winds which are often north and south rise over the trough and flow back on themselves quite symmetrically, which, perhaps, explains why the southerly wind after rising and overflowing produces heavier clouds and rain on the south side of the trough than does the northerly wind on the north side. In the northeast and southwest troughs the winds on the opposite sides, viz, the northerly wind on the west and the southerly wind on the east glide past each other with much less amount of overflow, so that the clouds on each side move from the southwest while those on the west side move from the northeast in the lower strata but from the northwest in the upper strata. Numerous references to these points in the structure of the troughs of low pressure will be found in some of the MONTHLY WEATHER REVIEWS that have been prepared by the present Editor; one of the most remarkable cases was that of February 22, 1874, described in the REVIEW of that month. Interesting cases of this kind over the land and the ocean are explained in the REVIEW for January 1894, p. 6, where the general rule is explained to the effect that when these troughs of low pressure constitute conditions of unstable equilibrium they finally break up and resolve themselves into whirls which are stable conditions; the center of the whirl which first appears at the south or west end, moves rapidly along the axis of the trough, increasing in intensity and extent until it becomes a well-marked storm center. It is very rare that a trough breaks up into two whirls, but in case it does so, the southern and western whirl is the more important and soon absorbs the other. The mechanical details of the American and Atlantic troughs must be homologous with the troughs described by Doberck in connection with the typhoons of the China Sea, and as the former frequently develop into Atlantic hurricanes so the latter develop into the east Indian typhoons.

[*To be continued.*]

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

When requests for back numbers of the MONTHLY WEATHER REVIEW are received from those who desire to complete their sets, and it appears that the stock on hand in Washington is exhausted, the Editor will mention such cases in the REVIEW, in order that those who are able and willing to supply the desired numbers may have an opportunity to do so. Penalty envelopes will be sent to those who desire to return their copies to the Weather Bureau, and the Editor will undertake to transmit them to their proper destination.

Prof. Conway Macmillan, Botanical Library, University of Minnesota, Minneapolis, Minn., desires to obtain a series of the publications of the Weather Bureau for that library.

Prof. P. E. Doudna, of the Colorado College at Colorado Springs, Colo., wishes to complete his set of the MONTHLY WEATHER REVIEW, and then place it in the college library. He needs the following numbers:

All of 1873 to 1877, inclusive.
1878, March and April.
1880, July to the end of the year.
All of 1881–1885, inclusive.
1886, January to October, inclusive.
1887, April.
1888, January to July, inclusive.
1889, January to June, inclusive; August.
1890, May; July to December, inclusive; Summary.
1891, January to July, inclusive.

The Annual Summary, considered as the last number of the annual volume of the MONTHLY WEATHER REVIEW, was first published with the volume for 1891. The reprint of the MONTHLY WEATHER REVIEW as a part of the Annual Report of the Chief Signal Officer of the Army ceased with the report for 1883. The annual reports of the Chief Signal Officer for 1884–1891 contain the tabular summaries, by months and years, similar to those that have since then been published in the annual reports of the Chief of the Weather Bureau.

METEOROLOGY IN GREAT BRITAIN.

Mr. William Allingham, of London, communicates to the Liverpool Journal of Commerce of March 24, a review of the report of the Meteorological Council of London, for the financial year 1897–98. He states that the small sum of £15,300 sterling is all that the Council has at its disposition to spend for climatology and storm warnings, and out of this sum £1,600 is repaid to the Government as its charge for telegraphy, in addition to a small sum for postage.

Mr. Allingham mentions the large sums appropriated by Russia, £45,000, and the United States, £195,000 for similar purposes, but he forgets to compare the relative areas of the countries. According to the Statesmen's Year Book, the area of Great Britain is 121,481 square miles, and the area of the United States, including Alaska, is 3,500,141 square miles, and that of Russia and Siberia, 8,660,282 square miles. If we divide the annual appropriations for meteorology by the areas of the States, we find that Great Britain spends 60 cents per square mile, while the United States spends 28 cents, and Russia spends only 26 cents. The expense of climatology increases, but that of storm warnings diminishes, as the area increases.

Special attention is given to ocean meteorology by the British and Russian officers, but in the United States this is done by a separate organization, viz, the Hydrographic Office of the Navy. With regard to weather forecasts Mr. Allingham says that the degree of success is greater than might be expected in consideration of the proverbial fickleness of British weather; 55 per cent of forecasts were completely verified, and 25 per cent partially so. Ninety per cent of the daily forecasts of rainy or fair weather during the hay-harvest were verified; 150 stations receive, by telegraph, warnings of approaching storms and display signals; out of 596 warnings 60 per cent were justified by gales. Mr. Allingham says:

> It is stated in the report that as telegraphic information can not be received from the Atlantic, the means of forecasting certain kinds of atmospheric disturbances are necessarily wanting. Surely this is scarcely the correct way of viewing these failures. Forecasting of weather is not, or at any rate ought not to be, on all fours with the signalling of trains from station to station on a railway. Something more than this is demanded from a professional weather forecaster. The general public will have weather forecasts and every nation worth mentioning has now a state-supported weather bureau. Some idea of the importance attached to this part of the work may be obtained by the fact that at least two of the daily papers in London have special weather forecasters of their own, who compete with the state-paid officials, and one of these papers actually receives weather telegrams from several stations in England, Ireland, and Scotland, which are forwarded sometimes six hours later than those sent from the same places to the central office of the state-supported weather bureau. Consequently, under the present system of weather forecasting, this paper ought occasionally to score when the forecast of authority is a failure.

BREAKING UP OF THE ICE AT PIERRE, S. DAK.

We quote the following table from the March report of the Iowa Weather and Crop Service. It is said to be reprinted from the Sioux City Journal, which copied it from a manuscript notebook kept by Pierre Chouteau the famous trader after whom Pierre received its name. The table purports to give the dates on which the ice in the Missouri broke up at Pierre; no further details are given as to whether in some cases, as often happens, the ice breaks and again closes up, but it is fair to assume that these are the dates of the final break up in each year:

Year.	Month.	Year.	Month.	Year.	Month.	Year.	Month.
1846	April 20	1857.....	March 26	1868.....	March 25	1879.....	March 31
1847......	April 10	1858.....	April 12	1869.....	March 29	1880.....	April 7
1848......	April 9	1859.....	April 18	1870.....	April 8	1881.....	March 27
1849......	April 1	1860....	March 24	1871.....	April 2	1882.....	April 4
1850......	April 3	1861.....	April 5	1872.....	March 14	1883.....	March 24
1851......	March 24	1862.....	March 27	1873.....	March 11	1884.....	March 28
1852... ..	March 22	1863.....	March 23	1874.....	April 14	1885.....	April 3
1853......	March 29	1864.....	April 15	1875.....	March 25	1886.....	March 16
1854.....	April 5	1865.....	April 13	1876. ...	March 30	1887.....	March 12
1855.....	March 30	1866. ...	April 7	1877.....	March 16	1888.....	April 1
1856......	April 6	1867.....	April 4	1878.....	March 23	1889.....	March 18